

REMARKS

Claim Rejections

Claims 78-82, 87, 88, 90-93 and 96 have been rejected under 35 USC §103, over Elder et al. (U.S. Patent No. 5,123,850) in a first set, in view of Nakano (JP HEI 3-69131) in a second set, and Blonder et al. (U.S. Patent No. 4,937,653), Bindra et al. (U.S. Patent No. 5,137,461), or Anschel et al. (U.S. Patent No. 5,420,520) in a third set.

Claims 78-82, 87, 88, 90-93 and 96 have been rejected under 35 USC §103(a) over Nakano in a first set in view of Blonder et al., Bindra et al. or Anschel et al., in a second set.

In response to the §103 rejections all of the claims have been amended. In addition the Examiner is asked to consider the arguments to follow.

Claims 78-82, 87, 88, 90-93 and 96 have been rejected under judicially created double patenting over claims 1-43 of U.S. Patent No. 5,302,891 in view of Nakano, Blonder et al., Bindra et al., and Anschel et al. In response to the double patenting rejections a Terminal Disclaimer is being filed concurrently with this Amendment.

Amended Claims

The claims have been amended to recite a --testing apparatus-- for testing semiconductor dice rather than an "attachment member" as previously claimed. The testing apparatus (fixture 11-Figure 8) includes a plate for retaining the die (die cavity plate 13-Figure 8), and a clamping mechanism (clamp 89-Figure 8, described at page 23, lines 1-16). The testing apparatus also includes a substrate (41-Figure 6) which makes the temporary electrical connections with the die (21-Figure 6) held in the testing apparatus (fixture 11-Figure 8). The substrate (41-Figure 6)

includes contacts (61-Figure 8) with raised portions (73-Figure 6) for penetrating pads (27-Figure 6) on the die to a self limiting penetration depth.

Recitation of a testing apparatus in the claims allows the construction of the contacts and raised members to be more clearly related to a biasing force exerted by the clamping mechanism. In the presently claimed test apparatus the contacts on the substrate are constructed such that the biasing force exerted on the die can be controlled on both the upper and lower ends. In addition, a relatively large operating range for the clamping mechanism can also be provided.

In particular the contacts are constructed such that a biasing force with which the clamping mechanism presses the die and substrate together is sufficient to cause the raised members on the contacts to penetrate the pads on the die. This is the lower limit of the biasing force. At the same time, the biasing force is selected to be less than a force required for a remainder of the contacts to penetrate the pads on the die. This is the upper limit of the biasing force. Page 18, lines 9-15 of the specification specifies the upper limit as being from two to ten times the lower limit.

Testing apparatuses for bare semiconductor dice, as disclosed by in Elder et al., are well known in the art. The Examiner has certainly seen his fair share. In all of these testing apparatuses a mechanism must be provided for biasing the die against an interconnect (i.e., substrate), which makes the temporary electrical connections with the die. It is advantageous for this biasing force to be as small as possible in order to prevent damage to the die. However, it is also necessary to oversize the biasing force to insure that all of the bond pads on the die are physically

contacted. A relatively wide range for the lower and upper limits is an advantage in constructing and assembling the testing apparatus.

The present test apparatus controls the lower limit of the biasing force by making the raised portions of the contacts small for penetrating the bond pads with a low biasing force. The upper limit of the biasing force is controlled by making the remainder of the contact relatively large, and with a flat surface for the raised portions. The configuration of the contacts thus provides a relatively large range for these limits which is an advantage for a self contained testing apparatus.

The Nakano contacts have the same basic structure presently claimed of a pointed probe contact 22 (Figure 2B) on a planar protuberance 21 (Figure 2B). However, there is no teaching of the relationship of this structure to a biasing force exerted by a test apparatus. In Nakano the pointed probe contact 22 (Figure 2B) is about the same size as the planar protuberance 21 (Figure 2B). Accordingly a small increase in the biasing force will cause the planar protuberance 21 to also penetrate into the pad 25 on the die. With Nakano the relationship of the contacts to the biasing force is not as critical because it is a probe card, and the biasing force can be more precisely controlled by an external force applying mechanism.

Unlike probe cards, testing apparatuses for bare dice, as presently claimed, are self contained units. Once the device is assembled, the biasing force cannot be controlled. The structure of the present contact allows a relatively large range to be selected for the biasing force because the raised portions (73-Figure 6) are much smaller than the remainder of the contact (61-Figure 6). Also by making multiple raised portions on the same contact, current can be spread out, while damage to the bond pad is minimized.

Unless one recognizes the principle of a force range and the above relationship of the contacts to the biasing force, there is no incentive for making the Nakano contacts with a larger number of smaller probe contacts 22. Neither Nakano, nor the references cited on multiple contact points (i.e., Blonder et al., Bindra et al., Anschel et al.) teaches a contact constructed to operate for a range of biasing force.

Besides there being no incentive for combining Blonder et al., Bindra et al., or Anschel et al., with Nakano, the resultant combination would be different in structure than the contact presently claimed. In particular, in each reference the multiple points on the contacts are in a saw tooth configuration with no spacing between the points. In the present contact, and as shown in Figure 6, the raised portions 73 are spaced from one another. This provides an advantage in that there is more flat surface to limit penetration, and a larger operating range for the biasing force can be achieved. In order to emphasize this difference, the amended independent claims state that the raised portions are "spaced". Antecedent basis for this recitation is provided by Figure 6.

The amended independent claims (78, 87, 92) also relate the force exerted by the clamping mechanism to the structure of the contacts. Antecedent basis for the force recitations is contained on page 17, lines 25-30, of the specification. In addition, independent claim 87 states that the force exerted by the clamping mechanism is "selected to be greater than a first force at which the raised portions penetrate the pads but less than a second force at which the surfaces penetrate the pads". Independent claim 92, state that a "second force" with which the surface of the contacts will penetrate the pads on the die is from "two to ten" times greater than a "first force" with which the raised portions penetrate the pads on the die. Antecedent basis for the

force range is contained on page 18, lines 9-15 of the specification.

The Examiner is asked to reassess the unobviousness of the claims from the view point of one skilled in the art at the time of the present invention. There is no suggestion in the prior art of a testing apparatus for bare die constructed with a specific relationship between the biasing mechanism and the contacts which make the temporary electrical connections. This relationship of the biasing mechanism and contacts provides a process advantage in that a relatively large operating range can be provided. Thus although the prior art contacts, particularly the Nakano contacts, appear to be similar to the presently claimed contacts, there are differences in structure and function which are an indication of the unobviousness of the present invention.

In view of the amendments and arguments, it is submitted that amended claims 78-82, 87, 88, 90-93 and 96 are now in a condition for allowance. Should any other issues remain, it is requested that the Examiner contact the undersigned attorney.

Also being submitted with this Amendment is a copy of the Change of Address for Correspondence that was previously filed on July 31, 1997. Please send all future correspondence to the address below.

Dated this 11th day of November, 1998.

✓ Respectfully submitted:



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